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AN UPPER CRETACEOUS FLORA.

The Cretaceous Flora of Southern New York and New England. By Arthur Hollick. Pp. 219, including 40 plates. (Washington: Government Printing Office, 1906.)

THE Cretaceous flora is of extreme interest to botanists, for it was during this period that the great, and, as it appears, sudden, change took place from the ancient type of Mesozoic vegetation, with its predominant Cycadophyta and Conifers, to a flora of an essentially modern *facies*, with the Angiosperms already supreme. The recent remarkable work of Dr. Wieland (NATURE, vol. Ixxv., p. 329; vol. Ixxvi., p. 113) has intensified the interest of this transformation from the old into the new, by showing that the Cycadophyta of the earlier Mesozoic had themselves evolved a floral organisation comparable to that of an Angiosperm, indicating that the dominant groups of the two floras, different as they appear, may yet prove to have been genetically related.

Dr. Hollick's monograph relates entirely to an Upper Cretaceous flora in which Angiosperms, or at least Dicotyledons, have completely assumed the leading rôle, and little trace of their cycad-like predecessors remains. The beds yielding the fossil plants belong to the "Island Series" of Dr. Lester Ward, who thus described their distribution:—

"From Morgan (New Jersey), . . . the formation may be traced northward across Staten Island and the northern shore of Long Island, and it reappears on Martha's Vineyard in the celebrated cliffs of Gay Head" (p. 13).

The horizon of the beds is mainly that of our Upper Chalk (Senonian), and possibly as old, in some cases, as late Cenomanian, but it is doubtful whether the intermediate Turonian is represented (p. 119). An interesting feature of the deposits is that the concretions containing the plant-remains almost always occur in glacial moraine, or in Cretaceous beds more or less disturbed by glacial action, and scarcely ever in their original positions (p. 26).

Of the 222 species to which a systematic position is assigned, six are referred to the Pteridophyta, 27 to the Gymnosperms, four to the Monocotyledons, and no less than 185 to the Dicotyledons. In spite of the many elements of doubt involved in all determinations of more or less fragmentary impressions, these figures probably give a fair though rough idea of the true proportions, and though further investigation may somewhat add to the relative importance of the Gymnosperms, there can be no doubt that the Dicotyledons had already completely gained the upper hand in the short interval, geologically speaking, since Lower Cretaceous times. The Cycadales, the characteristic plants of the earlier period, are represented by a few doubtful fragments. The fossils referred to Williamsonia by the author are, as he says, of uncertain affinity, and it has been suggested that they may rather be attributed to Magnoliaceæ, an

order which, on leaf-evidence, was largely represented in the flora.

The insignificance of the Monocotyledons is another striking point—the four fossils referred to them all seem somewhat dubious. The geological evidence, here and elsewhere, certainly weighs heavily on the side of the opinion, now widely held, that the Dicotyledons constitute the original angiospermous stock, from which the Monocotyledons have diverged.

The author's determinations are, at the present stage of investigation, necessarily based almost wholly on impressions of leaves, for such remains of flowers and fruits as have been found seldom seem to have helped materially in the identification. The botanist can rarely feel confidence in conclusions as to affinity derived from leaf-characters alone, and it is to be regretted that so many of the fossils are referred to recent genera, the evidence for such attribution being scarcely ever adequate. The author's object has apparently been to identify his specimens, generically or specifically, with those described by previous palæobotanists, rather than to determine their botanical affinities for himself. As an ample record of a rich flora the monograph has great value, especially from a stratigraphical point of view; but, as is usually the case with work on Upper Cretaceous or Tertiary plants, the data will need a far more critical treatment before any accurate botanical conclusions can be drawn.

In speaking of the coniferous remains, the author directs attention to the wide and interesting field open for future investigation in the examination of the internal structure of certain specimens. That the structure should so often be preserved is a most hopeful circumstance, and the work already done on some of this invaluable material by Prof. Jeffrey, of Harvard, partly in conjunction with the present author, shows how much may be looked for when the internal, as well as the superficial, characters of these interesting relics have been more widely investigated.

D. H. S.

PAPER MILL-WORKERS AND TECHNOLOGY.

Chapters on Paper-making. Vol. iii., Comprising a Short Practical Treatise in which Boiling, Bleaching, Loading, Colouring, and Similar Questions are discussed. Pp. viii+134; price 5s. net. Vol. iv., Containing Discussions upon Water Supplies and the Management of the Paper Machine, and its Influence upon the Qualities of Papers. Pp. vii+156; price 5s. net. By Clayton Beadle. (London: Crosby Lockwood and Son, 1907.)

THE author is one of a group of workers who aim at a progressive elevation of the standard of technological education and practice in this still very important branch of our productive industry. The paper-maker in this country has weighty reasons for preferring the "practical man" to, or before, the student of the theoretical basis of his practice. It is not the weighty reasons, however, which determine his attitude. It is the feminine quality or defect of pure prejudice; the argument is introduced *post hoc*

for its justification. The author, aware of this rule of prejudice, but encouraged by distinguished exceptions, adopts the plan of "pegging away." These volumes are the records of a scheme of higher education by correspondence. Questions directed to the elucidation of typical problems arising in the ordinary routine of the mill are set and distributed through the medium of the technical Press amongst the workers, who are invited to transmit their solutions of the problems to be criticised and corrected. A further object is to assist the workers in preparing for the more formal examination test of the City and Guilds Institute. At the same time, the questions propounded are judiciously chosen outside the formal or text-book range of the examinations syllabus of that excellent institution. We give a selection of subjects dealt with:—*Beating*, with sections on the size and speed of beater rolls, the efficiency of refining engines and edge runners; *Sizing, Colouring and Loading*, with special problems; the *Paper Machine*, with sectional treatment of dandy rolls, wire and suction boxes; the *Qualities of Papers* in relation to use, involving practical problems in "bulk," transparency, tenacity and stretch, special printing surfaces and the like.

The chapters follow one another without any attempt at a logical sequence, and each chapter comprises a selection of students' answers, also without any attempt at classification. The author's critical remarks alternate with the matter in inverted commas, and these criticisms are quite as unequal as his students' efforts. The reader is consequently confronted on each page with a species of pictorial puzzle, with the accompanying challenge to "find the policeman."

We say "policeman" taking the accepted symbol of law and order, and the student of technology is of course seeking instruction in these fundamental regulating factors of industrial processes. This defect of form, or want of form, necessarily limits the usefulness of these volumes. As a "causerie" on mill practice they will be found interesting and suggestive, but as a guide to technological instruction the matter should have been much more carefully ordered and edited. An important function of the teacher is to teach his subjects on positive, didactic lines, and the author abdicates this position in not prefacing each chapter with his own model answer to the questions propounded.

These "Chapters on Paper-making" notwithstanding constitute a most useful appeal to the latent intelligence of our mill workers.

Paper-mills are often so situated as to cut them off from tuition classes, and, further, it must not be forgotten that most workers are on night-shifts in alternate weeks, and this is a serious impediment to instruction by classes or lectures.

The author's educational work is therefore particularly deserving of encouragement, and with a little more conviction on his own part as to its solid value, he will probably see fit so to improve the form and style of subsequent "chapters" as more efficiently to supplement and complement the work of the technological institutions.

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LOCAL ORNITHOLOGY.

- (1) *Bird-Life of the Borders, on Moorland and Sea, with Faunal Notes extending over Forty Years.* By Abel Chapman. Pp. xii+458; map and illustrations. (London: Gurney and Jackson, 1907.) Price 14s. net.
- (2) *The Birds of Kent.* By William J. Davis. Pp. vi+304; plate and map. (Dartford: J. and W. Davis, 1907.) Price 6s. net.
- (3) *Notes on the Birds of Rutland.* By C. Reginald Haines. Pp. xlvi+175; 8 plates and map. (London: R. H. Porter, 1907.) Price 7s. 6d. net.
- (1) IN preparing the second edition of his pleasant and valuable account of the birds of the borders, Mr. Chapman has practically re-written on a broader basis the first section of the book, *i.e.* that relating to the Cheviots and the moorlands of the borders. The second part, which treats of the north-eastern sea-board, and, to some extent, may be considered as a treatise on the wild-fowling to be had on that coast, as well as an account of the wild-fowl to be met with there, has been merely revised.

The borderland stretching from Cheviot to the Solway comprises an area of hundreds of square miles of mountain and moor. The author defines the region covered by his observations as that mountain land which remains as it was created, unaltered by the hand of man, bounded by the line where the shepherd's crook supplants the plough; where heather and bracken, whinstone and black-faced sheep repel corn and cultivation; where grouse and blackcock yet retain their ancient domain, excluding partridge and pheasant; and where the ring-ouzel dispossesses the blackbird.

"A region largely of peat as distinguished from soil, of flowe, moss, and crag; of tumbling burns and lonely moorland, glorious in all its primeval beauty."

As on the higher fell-ranges of the borders it takes two to four acres to support each sheep; the hill country is very thinly inhabited. In this edition the author has slightly extended his purview so as to include the subjacent country, namely, the foothills which slope downwards from the higher range, "and which zone might perhaps be termed the sub-alpine region." This is the fringe of the moorland, yet it lies beyond the range of the plough, and its faunal character may be exemplified by the substitution of the blackcock, peewit, and whinchat for the red grouse, golden plover, and wheat-eat of the higher land. Here we come within the outer limit of many of the lowland woodland forms.

Beginning with the earlier months, the bird-life of the moorlands is traced in a succession of chapters throughout the year. The author having had forty years' experience of the district to which he is devotedly attached, and the book being preeminently one of personal observations, and of statements of facts, as seen by him, supplemented and expanded to some extent by theories which he felt justified in founding upon these observations, it follows that in these articles we have a very complete account of the avifauna of a district which is little known and visited.